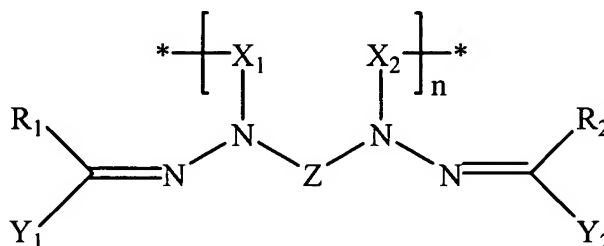


CLAIMS

What is claimed is:

1. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a charge transport composition having the formula



where Y_1 and Y_2 are, each independently, an arylamine group;

X_1 and X_2 are, each independently, a linking group;

R_1 and R_2 are, each independently, a hydrogen, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average value greater than 1; and

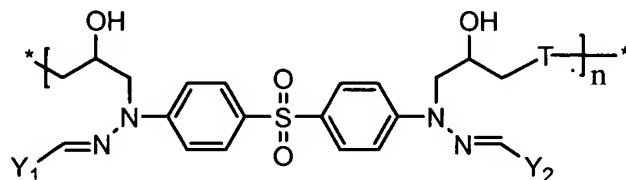
(b) a charge generating compound.

2. An organophotoreceptor according to claim 1 wherein Y_1 and Y_2 , each independently, comprise an (N,N-disubstituted)arylamine group, a julolidine group, or a carbazole group.

3. An organophotoreceptor according to claim 1 wherein X_1 and X_2 comprise, each independently, a $-(\text{CH}_2)_m-$ group where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a , R_b , R_c , R_d , R_e , and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

4. An organophotoreceptor according to claim 3 wherein at least one of the methylene groups is replaced by a heterocyclic group, an aromatic group, a CHOH group, O, or S.

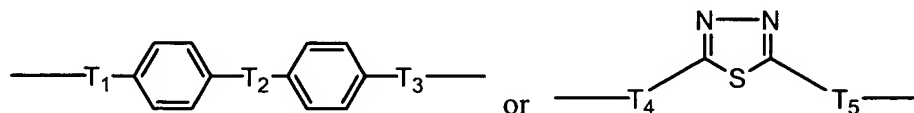
5. An organophotoreceptor according to claim 3 wherein the charge transport composition has the following formula:



where n is a distribution of integers between 1 and 100,000;

Y_1 and Y_2 are, each independently, an arylamine group; and

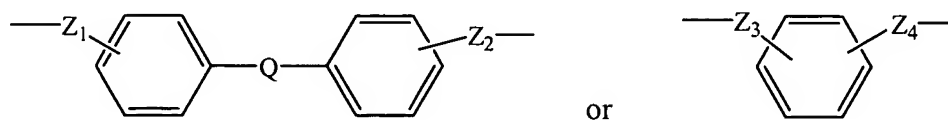
T has one of the following formulae:



where T_1 , T_2 , T_3 , T_4 , and T_5 are, each independently, O, S, O=S=O, or C=O.

6. An organophotoreceptor according to claim 1 wherein Z comprises a $-(CH_2)_k-$ group where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g , R_h , R_i , R_j , R_k , and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

7. An organophotoreceptor according to claim 6 wherein Z has the formulae:

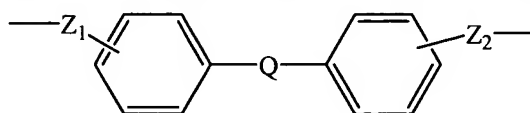


where Q is a bond, O, S, O=S=O, C=O, an aryl group, an NR_3 group, or a CR_4R_5 group,

where R_3 , R_4 , and R_5 are, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group; and

Z_1 , Z_2 , Z_3 , and Z_4 are, each independently, a bond or a $-(CH_2)_n-$ group where n is an integer between 1 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, Si, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7 group, a CR_8R_9 group, or a $SiR_{10}R_{11}$ group, where R_6 , R_7 , R_8 , R_9 , R_{10} , and R_{11} are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

8. An organophotoreceptor according to claim 7 wherein Z has the formula:



where Q is O=S=O, and Z_1 and Z_2 are, each independently, a bond.

9. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a second charge transport material.

10. An organophotoreceptor according to claim 9 wherein the second charge transport material comprises an electron transport compound.

11. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a polymer binder.

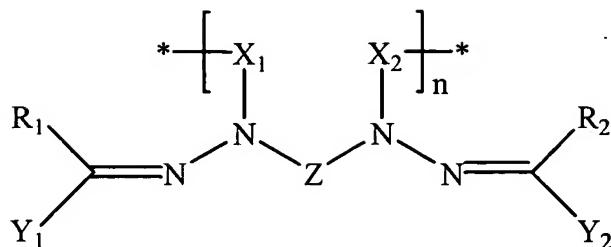
12. An electrophotographic imaging apparatus comprising:

(a) a light imaging component; and

(b) an organophotoreceptor oriented to receive light from the light imaging component,

the organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a charge transport composition having the formula



where Y₁ and Y₂ are, each independently, an arylamine group;

X₁ and X₂ are, each independently, a linking group;

R₁ and R₂ are, each independently, a hydrogen, an alkyl group, an alkenyl group, a

heterocyclic group, an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average of greater than 1;

and

(ii) a charge generating compound.

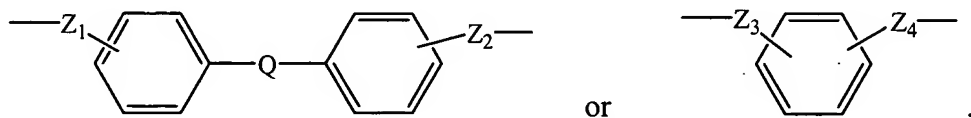
13. An electrophotographic imaging apparatus according to claim 12 wherein Y₁ and Y₂, each independently, comprise an (N,N-disubstituted)arylamine group, a julolidine group, or a carbazole group.

14. An electrophotographic imaging apparatus according to claim 12 wherein X₁ and X₂ comprise, each independently, a -(CH₂)_m- group where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

15. An electrophotographic imaging apparatus according to claim 14 wherein at least one of the methylene groups is replaced by a heterocyclic group, an aromatic group, a CHOH group, O, or S

16. An electrophotographic imaging apparatus according to claim 12 wherein Z comprises a $-(CH_2)_k-$ group where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g , R_h , R_i , R_j , R_k , and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group

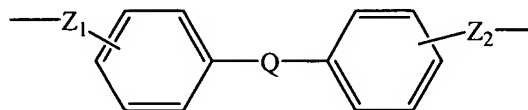
17. An electrophotographic imaging apparatus according to claim 16 wherein Z has the formulae:



where Q is a bond, O, S, O=S=O, C=O, an aryl group, an NR_3 group, or a CR_4R_5 group, where R_3 , R_4 , and R_5 are, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group; and

Z_1 , Z_2 , Z_3 , and Z_4 are, each independently, a bond or a $-(CH_2)_n-$ group where n is an integer between 1 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, Si, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7 group, a CR_8R_9 group, or a $SiR_{10}R_{11}$ group, where R_6 , R_7 , R_8 , R_9 , R_{10} , and R_{11} are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

18. An electrophotographic imaging apparatus according to claim 17 wherein Z has the formula:



where Q is O=S=O, and Z_1 and Z_2 are, each independently, a bond.

19. An electrophotographic imaging apparatus according to claim 12 wherein the photoconductive element further comprises an electron transport compound.

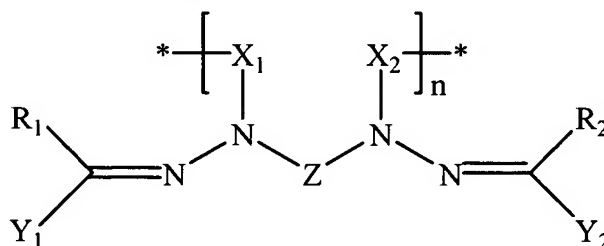
20. An electrophotographic imaging apparatus according to claim 12 wherein the photoconductive element further comprises a binder.

21. An electrophotographic imaging apparatus according to claim 12 further comprising a toner dispenser.

22. An electrophotographic imaging process comprising:

- (a) applying an electrical charge to a surface of an organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

- (i) a charge transport composition having the formula



where Y₁ and Y₂ are, each independently, an arylamine group;

X_1 and X_2 are, each independently, a linking group;

R₁ and R₂ are, each independently, a hydrogen, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average greater than 1; and

- (ii) a charge generating compound;

- (b) imagewise exposing the surface of the organophotoreceptor to radiation to dissipate charge in selected areas and thereby form a pattern of charged and uncharged areas on the surface;

- (c) contacting the surface with a toner to create a toned image; and

- (d) transferring the toned image to a substrate.

23. An electrophotographic imaging process according to claim 22 wherein Y_1 and Y_2 , each independently, comprise an (N,N-disubstituted)arylamine group, a julolidine group, or a carbazole group.

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24. An electrophotographic imaging process according to claim 22 wherein X_1 and X_2 comprise, each independently, a $-(CH_2)_m-$ group where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a , R_b , R_c , R_d , R_e , and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

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25. An electrophotographic imaging process according to claim 22 wherein Z comprises a $-(CH_2)_k-$ group where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g , R_h , R_i , R_j , R_k , and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

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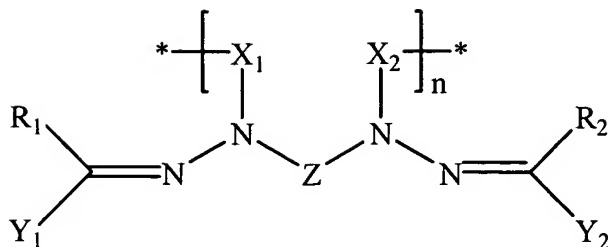
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26. An electrophotographic imaging process according to claim 22 wherein the photoconductive element further comprises an electron transport compound.

27. An electrophotographic imaging process according to claim 20 wherein the toner comprises a toner comprising colorant particles.

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28. A charge transport composition having the formula:



where Y₁ and Y₂ are, each independently, an arylamine group;

X₁ and X₂ are, each independently, a linking group;

R₁ and R₂ are, each independently, a hydrogen, an alkyl group, an alkenyl group, a

5 heterocyclic group, an aromatic group;

Z is a bridging group; and

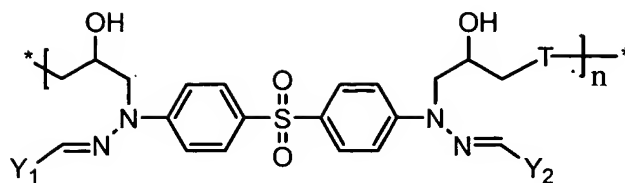
n is a distribution of integers between 1 and 100,000 with an average greater than 1.

29. A charge transport composition according to claim 28 wherein Y₁ and Y₂, each
 10 independently, comprise an (N,N-disubstituted)arylamine group, a julolidine group, or a carbazole group.

30. A charge transport composition according to claim 28 wherein X₁ and X₂ comprise, each
 15 independently, a -(CH₂)_m- group where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

20 31. A charge transport composition according to claim 30 wherein at least one of the methylene groups is replaced by a heterocyclic group, an aromatic group, a CHOH group, O, or S.

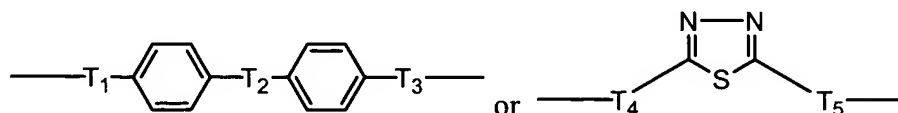
25 32. A charge transport composition according to claim 30 wherein the charge transport composition has the following formula:



where n is a distribution of integers between 1 and 100,000 with an average value greater than 1;

Y_1 and Y_2 are, each independently, an arylamine group; and

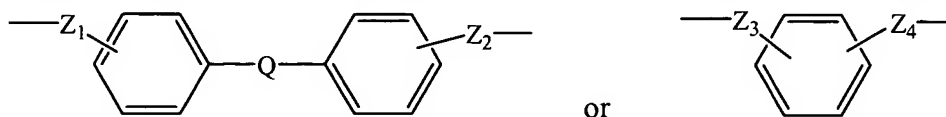
T has one of the following formulae:



where T_1 , T_2 , T_3 , T_4 , and T_5 are, each independently, O, S, O=S=O, or C=O.

33. A charge transport composition according to claim 28 wherein Z comprises a $-(CH_2)_k-$ group where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g , R_h , R_i , R_j , R_k , and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

34. A charge transport composition according to claim 33 wherein Z has the formulae:



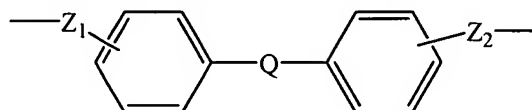
where Q is a bond, O, S, O=S=O, C=O, an aryl group, an NR_3 group, or a CR_4R_5 group,

where R_3 , R_4 , and R_5 are, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group; and

Z_1 , Z_2 , Z_3 , and Z_4 are, each independently, a bond or a $-(CH_2)_n-$ group where n is an integer between 1 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, Si, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7 group, a CR_8R_9 group, or a $SiR_{10}R_{11}$ group, where R_6 , R_7 , R_8 , R_9 , R_{10} , and R_{11} are, each independently, a bond, H, hydroxyl, thiol, carboxyl,

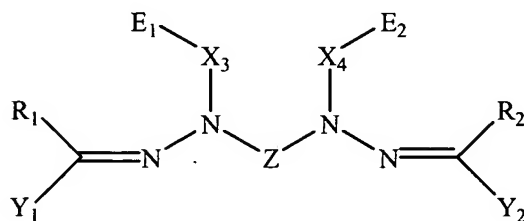
an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

35. A charge transport composition according to claim 34 wherein Z has the formulae:



where Q is O=S=O, and Z₁ and Z₂ are, each independently, a bond.

36. A charge transport composition prepared by co-polymerizing a multi-functional compound comprising at least 2 active hydrogens selected from the group consisting of hydroxyl hydrogen, amino hydrogen, carboxyl hydrogen, and thiol hydrogen with a reactive-ring compound having the following formula



where Y₁ and Y₂ are, each independently, an arylamine group;

X₃ and X₄, each independently, comprise a -(CH₂)_p- group, where p is an integer between 1 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_m group, a CR_n group, a CR_oR_p group, or a SiR_qR_r where R_m, R_n, R_o, R_p, R_q, and R_r are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group;

R₁ and R₂ are, each independently, a hydrogen, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group;

Z comprises a -(CH₂)_k- group where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g, R_h, R_i, R_j, R_k, and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group; and

E₁ and E₂ are, each independently, a reactive ring group.

37. A charge transport composition according to claim 36 wherein E₁ and E₂, each independently, are selected from the group consisting of 3-, 4-, 5-, 7-, 8-, 9-, 10-, 11-, and 12-membered heterocyclic ring groups.

38. A charge transport composition according to claim 36 wherein E₁ and E₂, each independently, are selected from the group consisting of 3-, 4-, 5-, 7-, 8-, 9-, 10-, 11-, and 12-membered cyclic ethers, cyclic amines, cyclic sulfides, cyclic amides, N-carboxy- α -amino acid anhydrides, lactones, and cyclosiloxanes.

39. A charge transport composition according to claim 36 wherein E₁ and E₂, each independently, are selected from the group consisting of epoxides, oxetanes, aziridines, thiiranes, 2-azetidinone, 2-pyrrolidone, 2-piperidone, caprolactam, enantholactam, and capryllactam.

40. A charge transport composition according to claim 36 wherein the multi-functional compound is selected from the group consisting of triols, triamines, trithiols, diols, dithiols, diamines, dicarboxylic acids, hydroxylamines, amino acids, hydroxyl acids, thiol acids, hydroxythiosl, and thioamines.